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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte CHRISTOPHER W. HILL, WEIMIN LI,
and GURTEJ S. SANDHU

Appeal 2009-005570
Application 10/067,410
Technology Center 2800

Before MARC S. HOFF, CARLA M. KRIVAK,
and ELENI MANTIS MERCADER, *Administrative Patent Judges*.

HOFF, *Administrative Patent Judge*.

DECISION ON APPEAL¹

¹ The two-month time period for filing an appeal or commencing a civil action, as recited in 37 C.F.R. § 1.304, or filing a request for rehearing, as recited in 37 C.F.R. § 41.52, begins to run from the “MAIL DATE” (paper delivery mode) or the “NOTIFICATION DATE” (electronic delivery mode) shown on the PTOL-90A cover letter attached to this decision.

STATEMENT OF THE CASE

Appellants appeal under 35 U.S.C. § 134(a) from a Final Rejection of claims 1-28. We have jurisdiction under 35 U.S.C. § 6(b).

We reverse.

Appellants' invention relates to a process for the in situ formation of a selective contact and a local interconnect on a semiconductor substrate, wherein deposition of the selective contact and local interconnect occurs within the same reaction chamber. A selective contact, such as a thin metal silicide layer, is deposited onto the exposed semiconductor substrate regions of a semiconductor substrate, when the semiconductor device structure is placed within a reaction chamber. A local interconnect is deposited over the semiconductor device structure while the semiconductor device remains in the reaction chamber (Abstract; Spec. ¶ [0013]).

Claim 1 is exemplary:

1. A method for fabricating an interconnect adjacent a contact of a semiconductor device structure, comprising:
 - causing a chemical reaction adjacent to a surface of at least one exposed, doped area of the semiconductor device structure to selectively deposit metal silicide thereon without reacting material of the at least one exposed, doped area ; and
 - depositing an interconnect material onto the metal silicide after and in situ with causing the chemical reaction.

The prior art relied upon by the Examiner in rejecting the claims on appeal is:

Chang	US 5,043,299	Aug. 27, 1991
Kolar	US 5,162,259	Nov. 10, 1992
Kim	US 5,821,164	Oct. 13, 1998
Shinriki	US 6,001,729	Dec. 14, 1999

Chen US 6,020,259 Feb. 1, 2000

Claims 1, 8-10, 12-14, 18-20, 23, and 25-28 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Chen.

Claims 2-5 and 21-22 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Chen in view of Chang.

Claims 6 and 7 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Chen in view of Kolar.

Claims 11 and 24 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Chen in view of Kim.

Claims 15-17 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Chen in view of Shinriki.

Rather than repeat the arguments of Appellants or the Examiner, we make reference to the Appeal Brief (filed March 8, 2007), the Reply Brief (filed November 19, 2008), and the Supplemental Examiner's Answer (mailed September 19, 2008) for their respective details.

ISSUE

The Examiner finds that one of ordinary skill in the art would have been motivated to cause a chemical reaction to selectively deposit metal silicide and deposit the interconnect material onto the metal silicide after and in situ, since both chemical deposition processes use CVD (Ans. 6). The Examiner finds that by subsequently changing the ambient environment inside the CVD reaction chamber from silicon-containing to nitrogen-containing, the deposition of both layers may occur in situ (Ans. 6). The

Examiner finds that it is practice to perform as many processing steps in a single reaction chamber to avoid contamination (Ans. 6).

Appellants contend that none of the references disclose the deposition of interconnect material onto metal silicide after and in situ with causing the chemical reaction, selectively depositing the metal silicide on a doped area of a semiconductor device structure (App. Br. 8; Reply Br. 3). Appellants argue further that the Examiner has not proffered any prior art that supports the assertion that depositing a contact material and an interconnect material in situ would have been “conventional practice” (Reply Br. 2). Finally, Appellants assert that without any prior art that teaches or suggests that a contact material and an interconnect material could be deposited in situ, the Examiner has not met the burden of establishing a prima facie case of obviousness against the claims (Reply Br. 2).

The Examiner’s findings and Appellants’ arguments present us with the following issue: Do the references of record disclose depositing an interconnect material onto a metal silicide after and in situ with the chemical reaction that selectively deposits metal silicide on the surface of at least one exposed doped area of a semiconductor device structure?

FINDINGS OF FACT

The following Findings of Fact (FF) are shown by a preponderance of the evidence.

The Invention

1. According to Appellants, the invention relates to a process for the in situ formation (i.e., in the same deposition chamber) of a selective contact (metal silicide contact 108) and a local interconnect (110) on a

semiconductor substrate (106). That is, the selective contact is deposited onto the exposed semiconductor substrate regions (107) of the semiconductor substrate when a semiconductor device (100) is placed within a reaction chamber. A local interconnect is deposited over the semiconductor device structure, while the semiconductor device remains in the reaction chamber. (Abstract; Figs. 1-4; Spec. ¶ [0013]).

Chen

2. Chen discloses TiSi_2 layer 36 selectively deposited in a contact hole 34 on substrate 2 using chemical vapor deposition (CVD) (col. 3, ll. 1-4) . In another step, a blanket chemical vapor deposition is carried out in a nitrogen ambient environment to form TiN interconnect layer 38 on isolation layer 32, a sidewall of contact hole 34, and the TiSi_2 layer 36 (col. 3, ll. 20-23).

PRINCIPLES OF LAW

On the issue of obviousness, the Supreme Court has stated that “the obviousness analysis cannot be confined by a formalistic conception of the words teaching, suggestion, and motivation.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 419 (2007). Further, the Court stated “[t]he combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.” *Id.* at 416.

ANALYSIS

Claims 1, 8-10, 12-14, 18-20, 23, and 25-28

Independent Claims 1 and 20 recite “depositing an interconnect material onto the metal silicide after and in situ with causing the chemical reaction.”

Appellants' arguments *supra* have persuaded us that the Examiner erred in finding that, given the disclosure of Chen, one of ordinary skill in the art would have been motivated to cause the chemical reaction to selectively deposit metal silicide and deposit the interconnect material onto the metal silicide after and in situ with the chemical reaction (Ans. 6).

Chen discloses selectively depositing a titanium silicide layer 36 and, thereafter, depositing interconnect material 38 (FF 2). Although Chen discloses that both deposition processes use CVD, Chen is silent as to both deposition processes occurring in the same CVD reaction chamber.

Therefore, we find that the Examiner has not established a prima facie obviousness of the claims because Chen does not teach deposition of an interconnect material onto a metal silicide after and in situ with the chemical reaction that selectively deposits the metal silicide. As a result, we will not sustain the Examiner's § 103 rejection of claims 1 and 20, nor the rejection of claims 8-10, 12-14, 18, 19, 23, and 25-28, dependent therefrom.

Claims 2-7, 11, 15-17, 21-22, and 24

As noted *supra*, we find that Chen does not teach all the features of independent claims 1 and 20. We have reviewed the Chang, Kolar, Kim, and Shinriki references, and we agree with Appellants that they do not cure the deficiencies of Chen. We therefore reverse the Examiner's rejection of claims 2-7, 11, 15-17, 21-22, and 24 under 35 U.S.C. § 103, for the same reasons expressed with respect to claims 1 and 20, *supra*.

CONCLUSION

The references of record do not disclose depositing an interconnect material onto a metal silicide after and in situ with the chemical reaction that

Appeal 2009-005570
Application 10/067,410

selectively deposits metal silicide on the surface of at least one exposed doped area of a semiconductor device structure.

ORDER

The Examiner's rejection of claims 1-28 is reversed.

REVERSED

ELD

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